

REMARKS

By this Amendment, Applicants cancel claims 15-17 and 19 without disclaimer of the underlying subject matter or prejudice against subsequent prosecution, and add new claims 20-23. Accordingly, claims 1-14, 18 and 20-23 remain pending in the application.

Reexamination and reconsideration of the present application are requested in view of the following remarks.

INTERVIEW SUMMARY

Pursuant to 37 CFR § 1.2 and § 1.133(b), and MPEP § 502.03, § 713.01, and § 713.04, Applicants hereby submit a record of conversations between the Examiner and the undersigned attorney on 26 and 28 May 2004.

On 26 May 2004, the Examiner telephoned the undersigned attorney to present a proposal whereby, if Applicants would agree to certain amendments to claims 4 and 9, then he was prepared to allow the application. Otherwise, he stated that he would issue a new Office Action for this application.

The Examiner's proposed amendments were as follows:

4. An apparatus that measures electrical characteristics of an electrical element within a semiconductor device in a packaged state, comprising:

an electrical characteristic measurer that is connected to the electrical element and a pad of the semiconductor device, and that is driven in response to a control signal to output to the pad a value that is indicative of the electrical characteristics of the electrical element,

the control signal being activated in an electrical characteristic measuring mode, after the semiconductor device is packaged,

wherein the electrical characteristic measurer includes an NMOS transistor having a drain and a source, one of the drain and the source being connected to the pad, and the other of the drain and the source being connected to a terminal of the electrical element, a size of the NMOS transistor being the same as a size of an NMOS transistor connected to a second pad of the semiconductor device which is connected to a data input/output pin,

wherein the pad is not connected to any output driver of the semiconductor device.

9. An apparatus for measuring characteristics of an electrical element within a semiconductor device in a packaged state, comprising:
a control signal generator, coupled to receive an address signal of the semiconductor device, that generates a control signal; and
an electrical characteristic measurer, to which the electrical element is connected, that is driven responsive to the control signal to output to a first pad of the semiconductor device a value indicative of the electrical characteristics of the electrical element,
the control signal being activated in an electrical characteristic measuring mode, after the semiconductor device is packaged,
wherein the first pad is not connected to any output driver of the semiconductor device.

The undersigned attorney informed the Examiner that he would have to present the proposal to Applicants for their decision.

On 28 May 2004 the undersigned attorney telephoned the Examiner to thank him for the proposal, but declined the proposal as Applicants did not believe that there was a need to amend the claims to make them allowable over the cited prior art.

35 U.S.C. § 103

The Office Action rejects: claims 1, 3 and 5-8 under 35 U.S.C. § 103 over Kameda U.S. Patent No. 6,442,009 ("Kameda") in view of Stambaugh et al. U.S. Patent No. 4,970,454 ("Stambaugh"); claims 2 and 9-14 over Kameda in view of Stambaugh and further in view of Roberts et al. U.S. Patent No. 5,743,661 ("Roberts"); and claim 18 under 35 U.S.C. § 103 over Kameda in view of Stambaugh and Roberts and further in view of Roohparvar U.S. Patent No. 6,275,961 ("Roohparvar").

Applicants respectfully traverse those rejections for at least the following reasons.

Claim 1

Among other things, the apparatus of claim 1 features an electrical characteristic measurer that is connected to the electrical element and is driven in

response to a control signal to output to a pad a value that is indicative of the electrical characteristics of the electrical element, wherein the pad is not connected to any output driver of the semiconductor device.

For example, as disclosed in the specification with respect to the embodiment of FIG. 5 of the present Specification, beneficially, the pad to which the electrical characteristic measurer is connected and to which it outputs the value that is indicative of the electrical characteristics of the electrical element, is an RQ PAD that is adapted to receive external addresses or commands (see page 9, paragraph 0031). Such a pad only includes an input receiver, and does not have an output driver since it is adapted to receive input signals, but not to transmit output signals.

The Office Action states that Kameda discloses an electrical characteristic measurer that is connected to the electrical element and outputs to a pad a value that is indicative of the electrical characteristics of the electrical element, wherein the pad is not connected to any output driver of the semiconductor device.

Applicants respectfully disagree.

The M.P.E.P. §§ 2142 & 2143 each state that the prior art reference (or references when combined) must teach or suggest all the claim limitations. Meanwhile, M.P.E.P. § 2112 specifies that express, implicit, and inherent disclosures of a prior art reference may be relied upon in the rejection of claims under 35 U.S.C. 102 or 103. Here, Applicants have claimed the absence of a connection between the pad and any output driver of the semiconductor device.¹ Applicants respectfully submit that Kameda does not expressly, implicitly, or inherently disclose that the pad (PAD) is not connected to any output driver of the semiconductor device.

Indeed, Kameda discloses that the PAD is “an input/output pad” (col. 4, lines 15-16). That is, although not explicitly mentioned by Kameda, the PAD is connected to an output circuit that would indeed have an output driver. In any event, Kameda certainly does not disclose (expressly, implicitly or inherently) the absence of a

¹ In that regard, Applicants note that the absence of a disclosure is not the same as the disclosure of an absence.

connection between the pad and any output driver of the semiconductor device.

Meanwhile, the pad 28 shown, for example, in FIG. 3 of Stambaugh is connected to a functional circuit 54 that includes an output driver 60. That is, the pad 28 of Stambaugh is connected to an input/output pin 36 (see col. 5, line 26; col. 3, lines 46-47) and therefore to an output driver.

So, no combination of Kameda and Stambaugh would produce an electrical characteristic measurer that is connected to the electrical element and outputs to a pad a value that is indicative of the electrical characteristics of the electrical element, wherein the pad is not connected to any output driver of the semiconductor device.

Also among other things, the apparatus of claim 1 features an electrical characteristic measurer that is connected to the electrical element and a pad of the semiconductor device, and that is driven in response to a control signal to output a value that is indicative of the electrical characteristic of the electrical element to the pad.

The Office Action states that Kameda discloses an electrical characteristic measurer (citing elements QN and G1) that is connected to the electrical element, and that outputs a value that is indicative of the electrical characteristics of the electrical element.

Applicants respectfully disagree.

At the outset, Applicants respectfully submit that Kameda does not disclose an electrical characteristic measurer. In particular, elements QN and G1 do not measure an electrical characteristic (e.g., threshold voltage, saturation current, resistance) of any electrical element. They do not output any value that is that is indicative of the electrical characteristic of any electrical element. They simply communicate binary test data to the outside of the chip. Indeed, the Office Action does not even identify any electrical element (or any electrical characteristic thereof) which is supposedly being measured by elements QN and G1.

Accordingly, for at least the foregoing reasons, Applicants respectfully submit that claim 1 patentable over any possible combination of Kameda and Stambaugh.

Claims 3 and 5-8

Claims 3 and 5-8 depend from claim 1 and are deemed to be allowable for at least that reason, and for the following additional reasons.

Claim 3

Among other things, in the apparatus of claim 3, the electrical element is selected from a group including an NMOS transistor, a PMOS transistor and a resistor, and the value is indicative of one of a threshold voltage and a saturation current of the NMOS transistor, one of a threshold voltage and a saturation current of the PMOS transistor, and a resistance of the resistor.

Although the Office Action states that such a feature is disclosed at col. 5, lines 9-22 of Kameda, Applicants respectfully disagree. Applicants see nothing in col. 5, lines 9-22 of Kameda that discloses outputting any value that indicates a threshold voltage, a saturation current, or a resistance. Instead, all that is disclosed is outputting a binary value indicating some unspecified test data for the device.

Claims 5-7

Among other things, in the apparatuses of claims 5-7, the electrical element is a transistor, and the value is indicative of one of a threshold voltage and a saturation current of the transistor.

The Office Action fairly concedes that Kameda fails to suggest any such feature. However, the Office Action states that Stambaugh discloses such a feature and that it would have been obvious to modify Kameda's device to include such a feature.

Applicants respectfully disagree and respectfully traverse the proposed combination as non-functional and also (quite understandably) lacking any suggestion in the prior art.

At the outset, if one were for some unknown reason motivated to replace the element "R" in FIG. 3 of Kameda with a transistor, Kameda's circuit absolutely and very clearly would **not** allow one to measure the threshold voltage or saturation current of the transistor. Clearly all that the circuit QN and G1 allows one to output

are binary values.

Furthermore, there is no suggestion in the prior art that would lead anyone (or teach anyone how) to modify Kameda's circuit – whose principle purposes are to provide overvoltage protection and to output test data – to measure a threshold voltage or saturation current of a transistor. Therefore, the proposed combination is traversed.

Accordingly, for at least these additional reasons, Applicants respectfully submit that claims 5-7 are all patentable over the cited prior art.

Claim 9

Among other things, the apparatus of claim 9 features an electrical characteristic measurer, to which the electrical element is connected, that is driven responsive to the control signal to output to a first pad of the semiconductor device a value indicative of the electrical characteristics of the electrical element, wherein the first pad is not connected to any output driver of the semiconductor device.

As explained above with respect to claim 1, neither Kameda nor Stambaugh nor any possible combination thereof would produce an apparatus including such features. Applicants respectfully submit that Roberts fails to supply these missing features.

Accordingly, for at least these reasons, Applicants respectfully submit that claim 9 is patentable over Kameda in view of Stambaugh and further in view of Roberts.

Claims 10-14

Claims 10-14 depend from claim 9 and are deemed to be allowable for at least that reasons set forth above with respect to claim 9, and for the following additional reasons.

Claim 11

Among other things, in the apparatus of claim 11, the electrical element is a transistor, and the value is indicative of one of a threshold voltage and a saturation current of the transistor.

The Office Action fairly concedes that Kameda fails to suggest any such feature. However, the Office Action states that Stambaugh discloses such a feature

and that it would have been obvious to modify Kameda's device to include such a feature.

Applicants respectfully disagree and respectfully traverse the proposed combination for at least the reasons set forth above with respect to claims 5-7.

Accordingly, for at least these additional reasons, Applicants respectfully submit that claims 5-7 are all patentable over the cited prior art.

Claim 18

Claim 18 depends from claim 9. Applicants respectfully submit that Roohparvar fails to remedy the shortcomings of Kameda, Stambaugh and Roberts with respect to claim 9, as set forth above.

Accordingly, Applicants respectfully submit that claim 18 is patentable over Kameda, Stambaugh and Roberts in view of Roohparvar for at least the reasons set forth above with respect to claim 9, and for the following additional reasons.

Among other things, the apparatus of claim 18 features an electrical characteristic measurer having an NMOS transistor, a size of the NMOS transistor being the same as a size of an NMOS transistor connected to a second pad that is connected to a data input/output pin, wherein an output driver of the semiconductor device is connected to the second pad.

Applicants respectfully submit that the cited text at col. 13, lines 27-30 of Roohparvar clearly does not disclose or remotely suggest such a feature.

As explained above with respect to similar features in claim 4, the cited art does not disclose the two NMOS transistors having the same size.

Meanwhile, Applicants also note that claim 18 recites that the two NMOS transistors are connected to two different pads: (1) a first pad connected to an electrical characteristic measurer (the first pad is not connected to any output driver of the semiconductor device); and (2) a second pad of a data input/output pin (the second pad is connected to any output driver of the semiconductor device).

Again, Applicants respectfully submit that the cited text at col. 13, lines 27-30 of Roohparvar clearly does not disclose or remotely suggest such a feature.

Accordingly, for at least these reasons, Applicants respectfully submit that claim 18 clearly defines over the cited prior art.

NEW CLAIMS 20-23

New claims 20-23 all depend from claim 1 and are deemed patentable over the prior art for at least the reasons set forth above with respect to claim 1. Applicants respectfully submit that new claims 20-23 are all fully supported by the specification and are also patentable over the prior art for at least the following additional reasons.

Claim 20

Among other things, in the apparatus of claim 20 the electrical characteristic measurer is adapted to supply a fixed current to the electrical element. Exemplary embodiments including such a feature are disclosed, for example, in paragraph [0034] on page 10, in paragraph [0038] on page 11, etc.

The prior art references taken alone or collectively do not suggest such a feature. Indeed, such a feature is not only impossible with the apparatus disclosed by Kameda, it is directly contrary to the fundamental principles of Kameda.

Accordingly, for at least these additional reasons, Applicants respectfully submit that claim 20 is patentable over the cited prior art.

Claim 21

Claim 21 depends from claim 20 and is deemed patentable for all the reasons set forth above with respect to claim 20, and the following additional reasons.

Among other things, in the apparatus of claim 21, the electrical characteristic measurer outputs a voltage indicating a threshold voltage of the electrical element.

Applicants respectfully submit that the prior art references taken alone or collectively do not suggest such a feature, for at least the reasons set forth above with respect to claims 5-7.

Accordingly, for at least these additional reasons, Applicants respectfully submit that claim 21 is patentable over the cited prior art.

Claim 22

Claim 22 depends from claim 20 and is deemed patentable for all the reasons set forth above with respect to claim 20, and the following additional reasons.

Among other things, in the apparatus of claim 20, in response to the fixed current, the electrical characteristic measurer outputs a value indicating a resistance of the resistor.

Applicants respectfully submit that the prior art references taken alone or collectively do not suggest such a feature.

Accordingly, for at least these additional reasons, Applicants respectfully submit that claim 22 is patentable over the cited prior art.

Claim 23

Among other things, in the apparatus of claim 23, the electrical element is one of an NMOS and PMOS transistor, and the electrical characteristic measurer is adapted to supply a fixed voltage to the electrical element.

Applicants respectfully submit that the prior art references taken alone or collectively do not suggest such features.

Accordingly, for at least these additional reasons, Applicants respectfully submit that claim 23 is patentable over the cited prior art.

REQUEST THAT CLAIM 4 BE ADDED BACK INTO APPLICATION

Applicants respectfully submit that the subject matter of claim 4 is very closely related to the subject matter of claim 1, and particularly claim 18, which are now deemed to be in condition for allowance. Applicants respectfully submit that examination of claim 4 – which has already been examined twice previously in connection with this application – at this time does not present any undue burden on the Patent Office and is consistent with the principles of M.P.E.P. § 803. Applicants also respectfully submit that claim 4 is patentable over the cited art for the reasons specifically set forth above with respect to claim 18.

Accordingly, Applicants respectfully request that the Examiner reconsider and

withdraw the requirement that claim 4 be restricted from examination in this application, and that claim 4 be examined and allowed at this time.

CONCLUSION


In view of the foregoing explanations, Applicants respectfully request that the Examiner reconsider and reexamine the present application, allow claims 1-14, 18 and 20-23, and pass the application to issue. In the event that there are any outstanding matters remaining in the present application, the Examiner is invited to contact Kenneth D. Springer (Reg. No. 39,843) at (703) 715-0870 to discuss these matters.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 50-0238 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17, particularly extension of time fees.

Respectfully submitted,

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